National Aeronautics and
Space Administration

ARSET

Applied Remote Sensing Training

http://arset.gsfc.nasa.gov

@NASAARSET

Disaster Risk Reduction Across the Americas

Discussion Sessions:

Remote Sensing for General Disaster Management

Instructors:

- Erika Podest: ARSET, Erika.Podest@jpl.nasa.gov
- Tim Stough: ARSET, stough@jpl.nasa.gov

Week 1

Course Structure

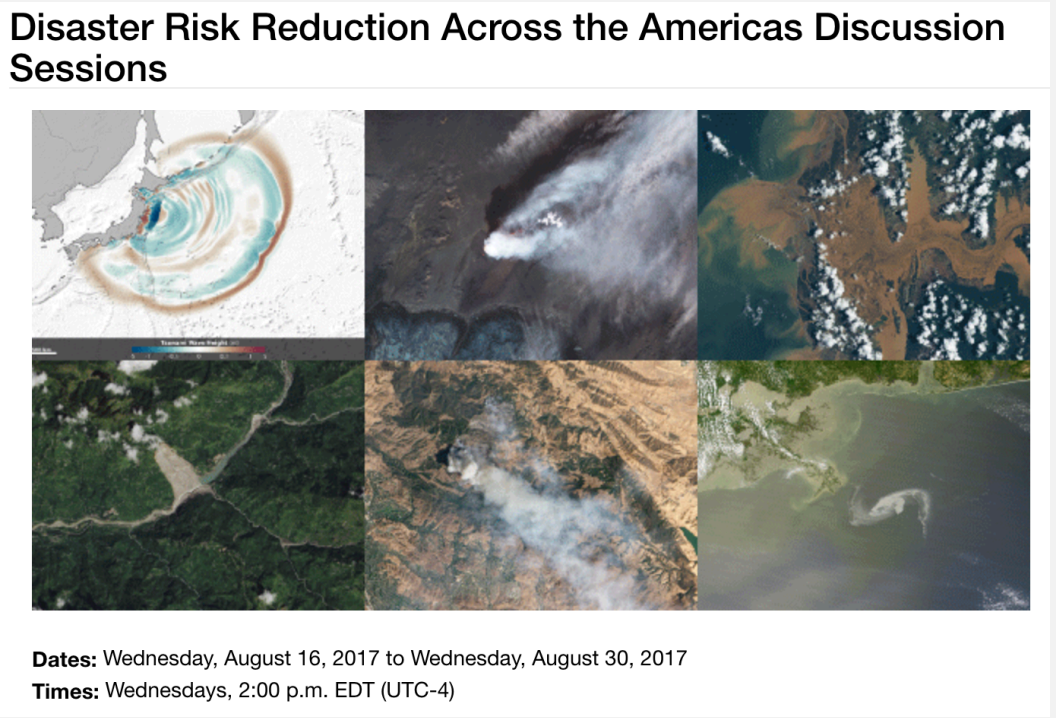
- **One session per week on August 16, 23, 30, 2017**
  – 2 p.m. – 3 p.m. EDT (UTC-4)
- **Each session will include**
  – A Short Introduction (~10 min.)
  – Online Question and Answer (~50 min.)
- **Additional Q&A by email to:**
  – Erika Podest: erika.podest@jpl.nasa.gov
  – Tim Stough: stough@jpl.nasa.gov
  – Amita Mehta: amita.v.mehta@nasa.gov

Course Material

https://arset.gsfc.nasa.gov/disasters/webinars/dpraas-17

Prerequisite webinar presentations, and recordings

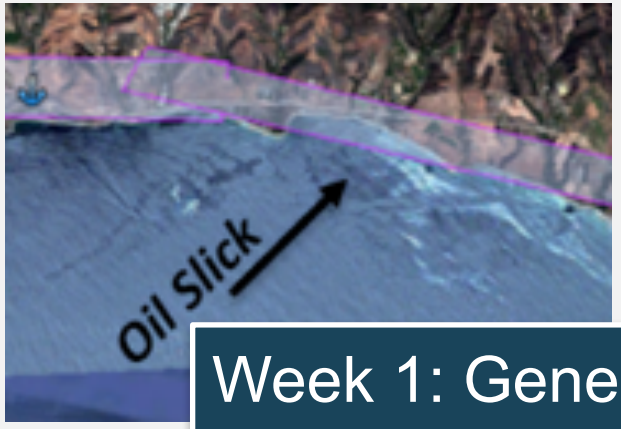
Links will be available on the ARSET course page



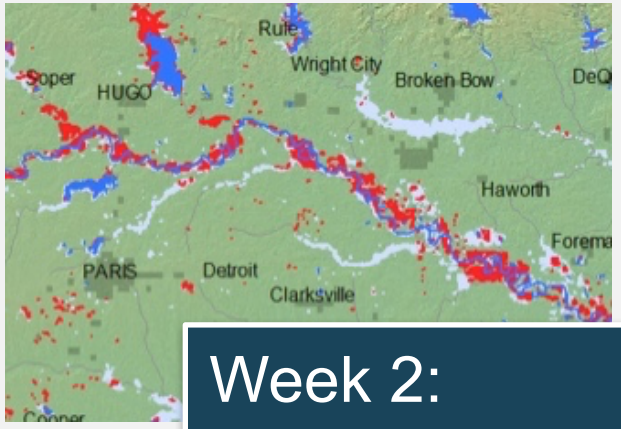
Course Objectives

- Participants will become aware of available NASA resources for disaster management via the prerequisites
- Participants will be able to address questions to NASA ARSET and disaster program personnel
- Keep in mind that you are **expected to review the prerequisite webinars**. If you have not, you may not have sufficient background to follow the discussion

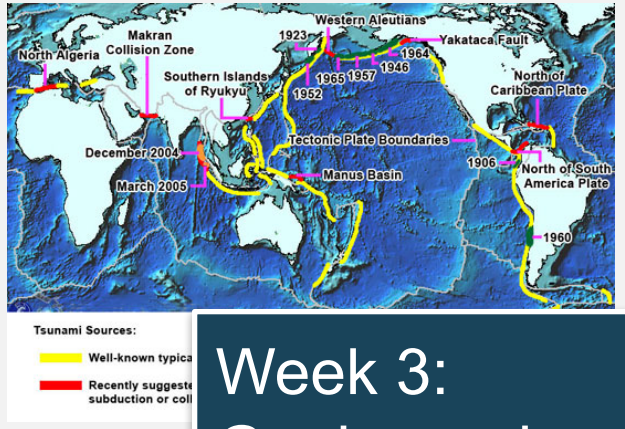
Course Outline



Week 1: General Disaster Management Discussion



Week 2: Hydrometeoro-logical Disasters (Flooding, Tropical Storms) Discussion



Week 3: Geohazards (Earthquakes, Landslides, Tsunamis) Discussion

Outline

- A Few Highlights from the Prerequisites
  - Fundamentals of Remote Sensing
  - Wildfire
  - Volcanic ash
  - Oil spill or Toxic release
- Question and Answer Format
- Your Questions

Fundamentals of Remote Sensing

What is Remote Sensing?

Measurement of a quantity associated with an object by a device not in direct contact with the object

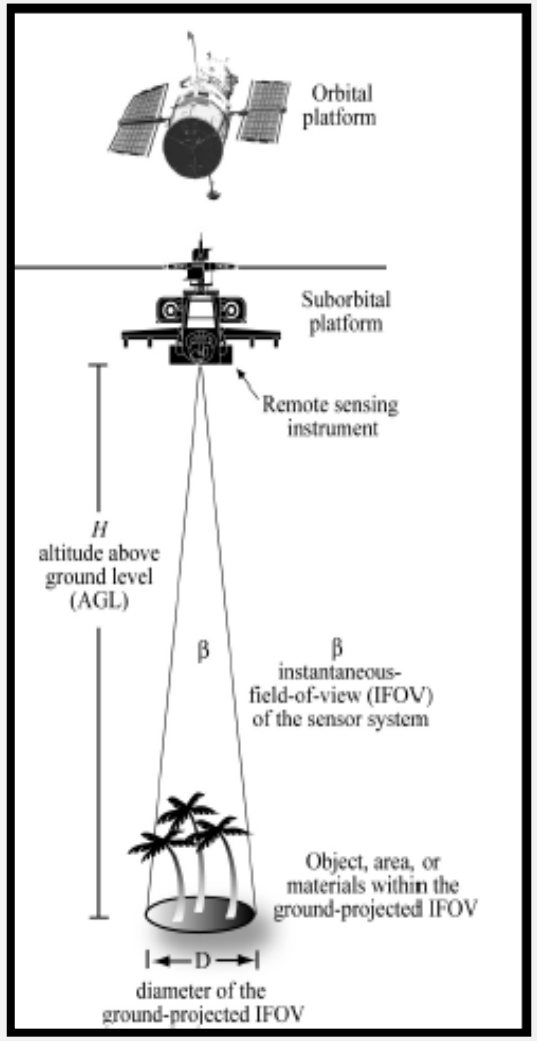


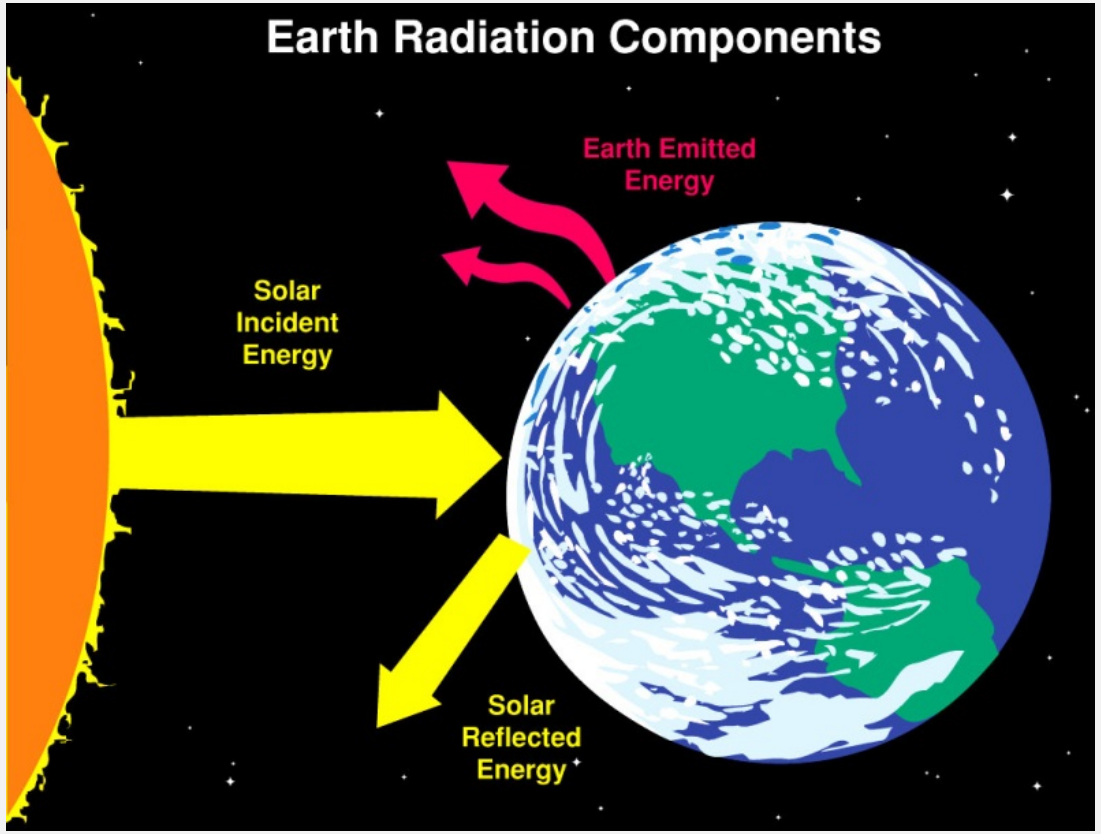
The most useful platform depends on the application

- What information do you want? How much detail?
- How frequent do you need the measurements to be?

Satellite Remote Sensing

Satellites carry instruments or sensors that **measure electromagnetic radiation** coming from the Earth-atmosphere system





Remote Sensing for Wildfires

Landsat for Fire Mapping

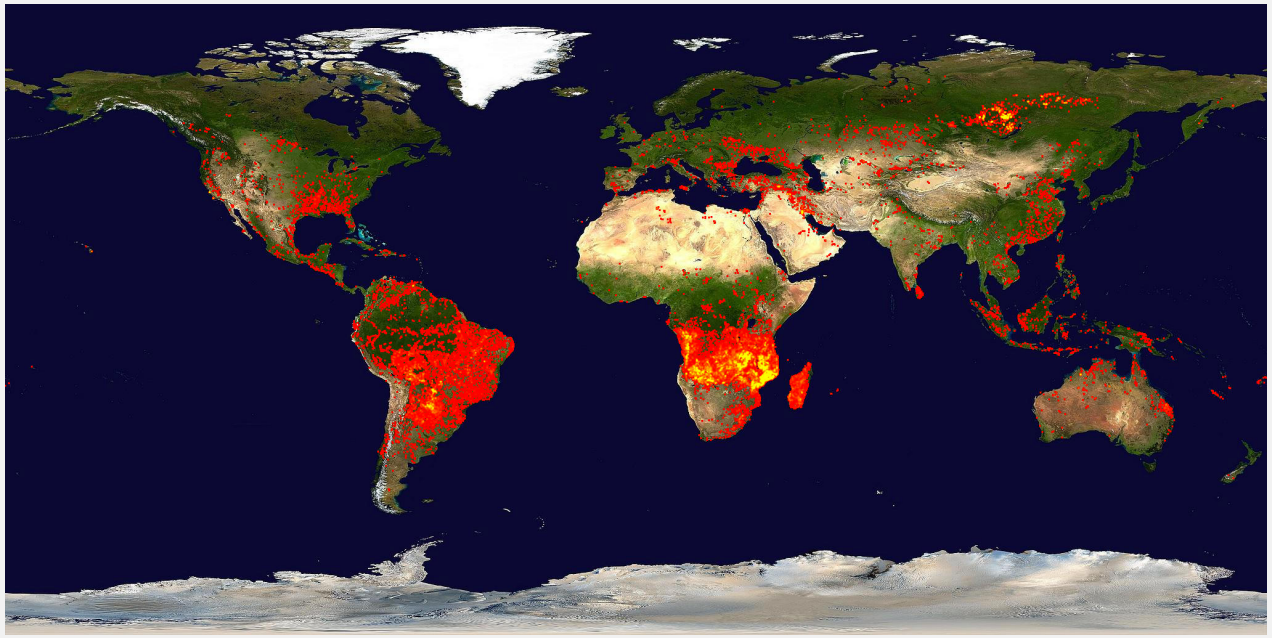
- Burn Severity:
  - Degree to which a site has been altered or disrupted by fire
  - Loosely, a product of fire intensity and residence time
  - The effect of a fire on ecosystem properties, often defined by the degree of mortality of vegetation
- How do we connect pixels in a satellite image to burn severity?
  - Use spectral properties

Top: Landsat image from September 15, 2016. False color image shows extent of the Soberanes Fire in California

Bottom: Post-wildfire landscape. Image Credit: Bcasterline

MODIS Fire Products

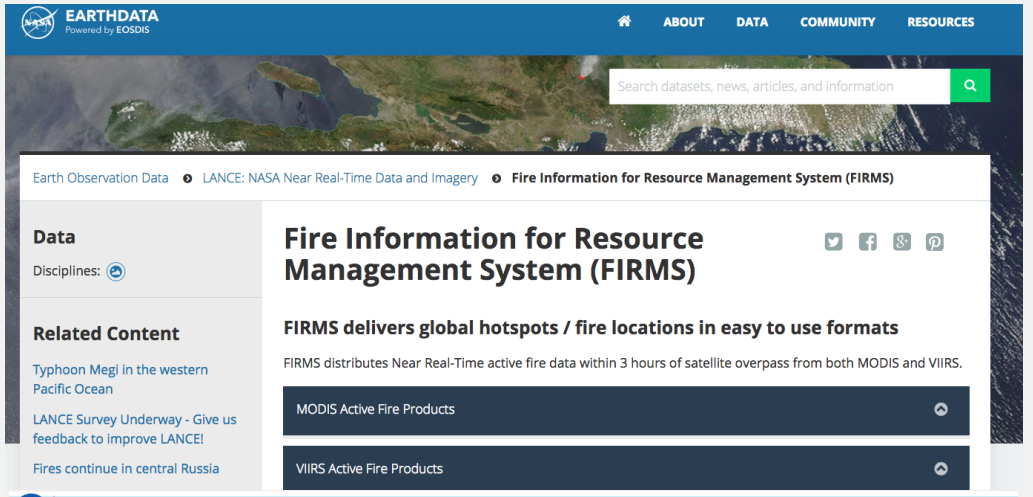
- Near Real-Time Thermal Anomalies and Fire Locations
- Provides snapshots of active burning fires and burned areas
- The Active Fire product delivers actively burning locations on a daily basis at 1 km resolution (additional 8 day and monthly products)



Global Fire Map
September 17–26, 2016
Colors range from red, where the fire count is low, to yellow where the number of fires is large

Fire Information for Resource Management System (FIRMS)

- Distributes near real-time (NRT) active fire data within 3 hours of satellite overpass
- Delivers global MODIS and VIIRS hotspots/fire locations and MODIS burned area images
- Provides historical data (older than 7 days) using the Archive Download Tool
- Available in various formats:
  - Email alerts
  - GIS-friendly file format
  - Visualization in Web Fire Mapper or Worldview



Monitoring Volcanic Ash Using Remote Sensing

The Volcanic Ash Problem for Aviation

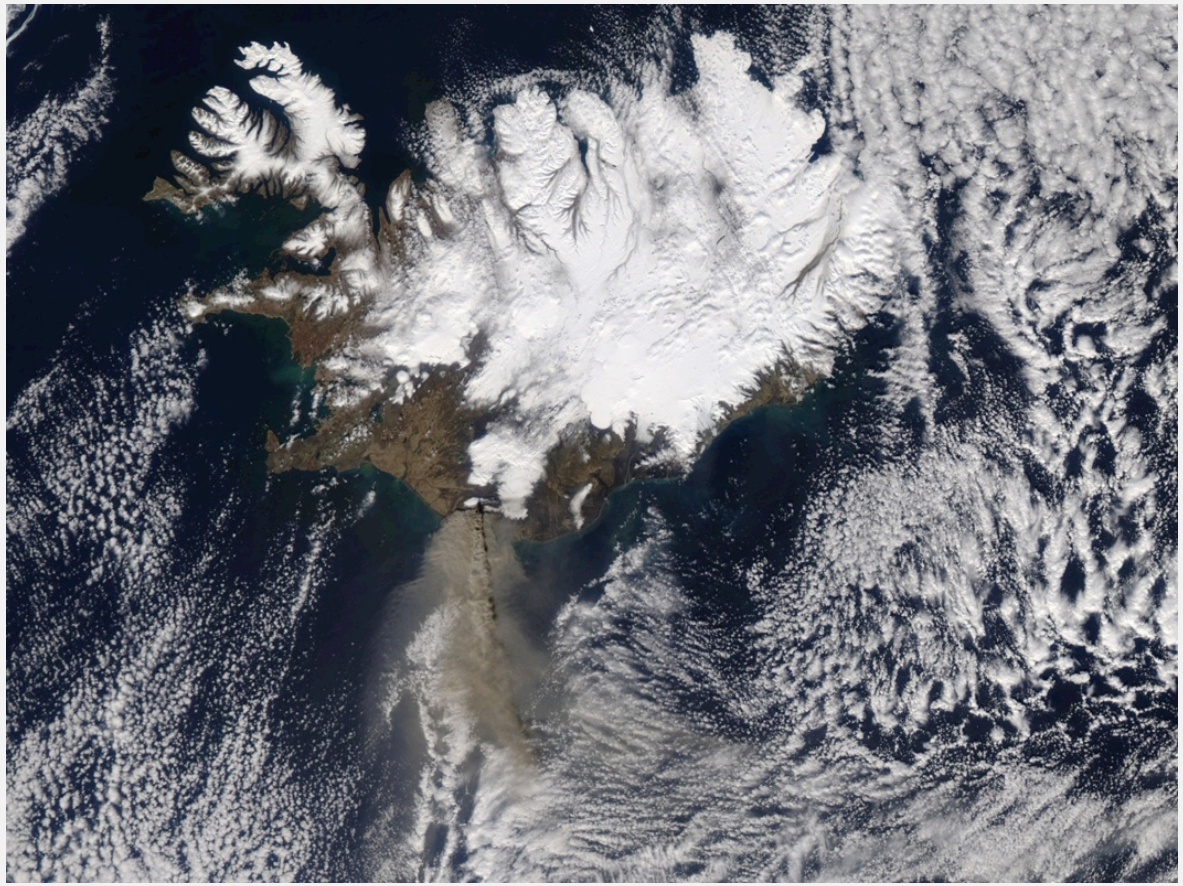
- Air traffic is periodically faced with the threat of a volcanic ash encounter
  - Ash immediately after eruption is most threatening
  - Even over many hours, ash may still cause serious problems for aircraft
  - No aircraft have crashed from an ash encounter, but there have been several close calls

Sicily's Mt. Etna, October 2002; MODIS

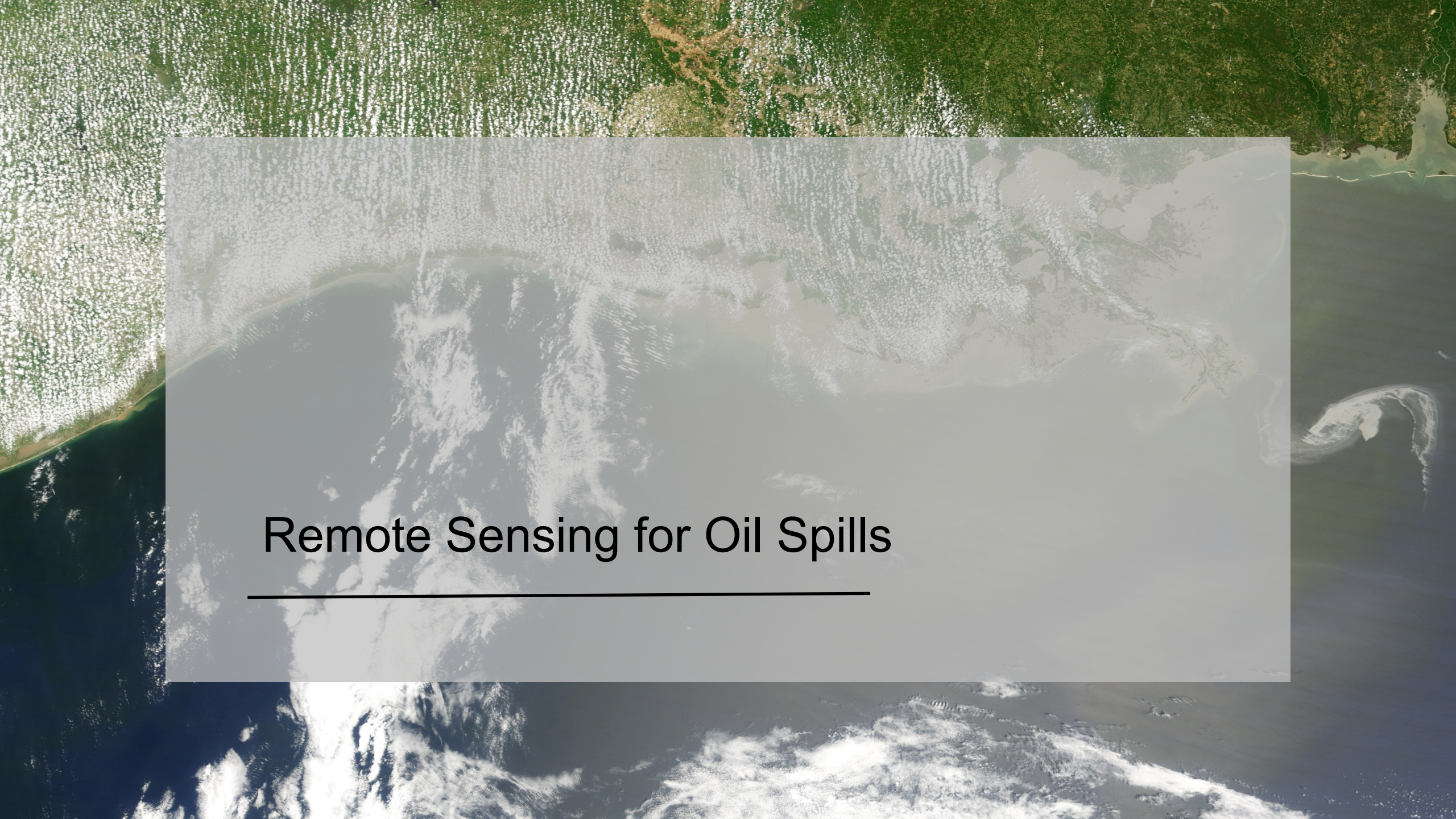
Detecting Volcanic Ash with Remote Sensing

Eyjafjallajökull Volcano, April 17, 2010

- Satellite imagers typically provide the best source of information about ash location
- This visible light image is the sort that typically comes to mind
- However, multispectral imagery does a better job of separating ash and SO_2



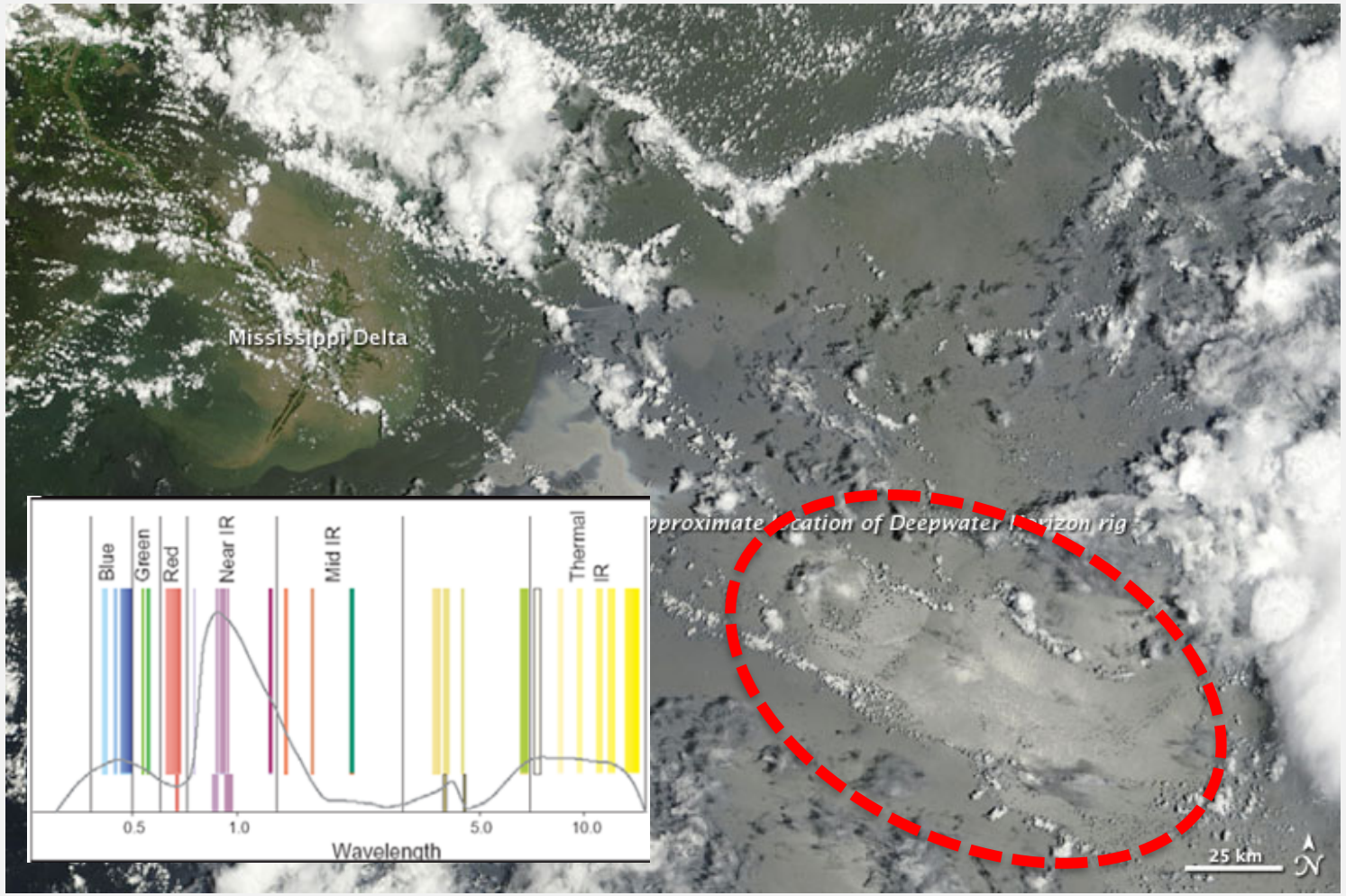
Eyjafjallajökull, April 2010; MODIS



Remote Sensing for Oil Spills

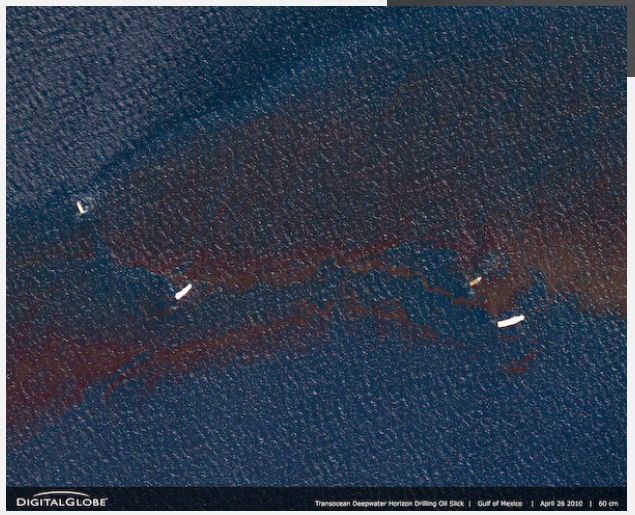
Why Space Remote Sensing of Oil

- Space remote sensing can provide a synoptic view
- Can inspect remote areas as quickly as targetable
- Can collect data when weather prevents airborne observers take off
- Some products can be communicated readily to public
- Can evaluate ecological damage



Issues with Remote Sensing of Oil

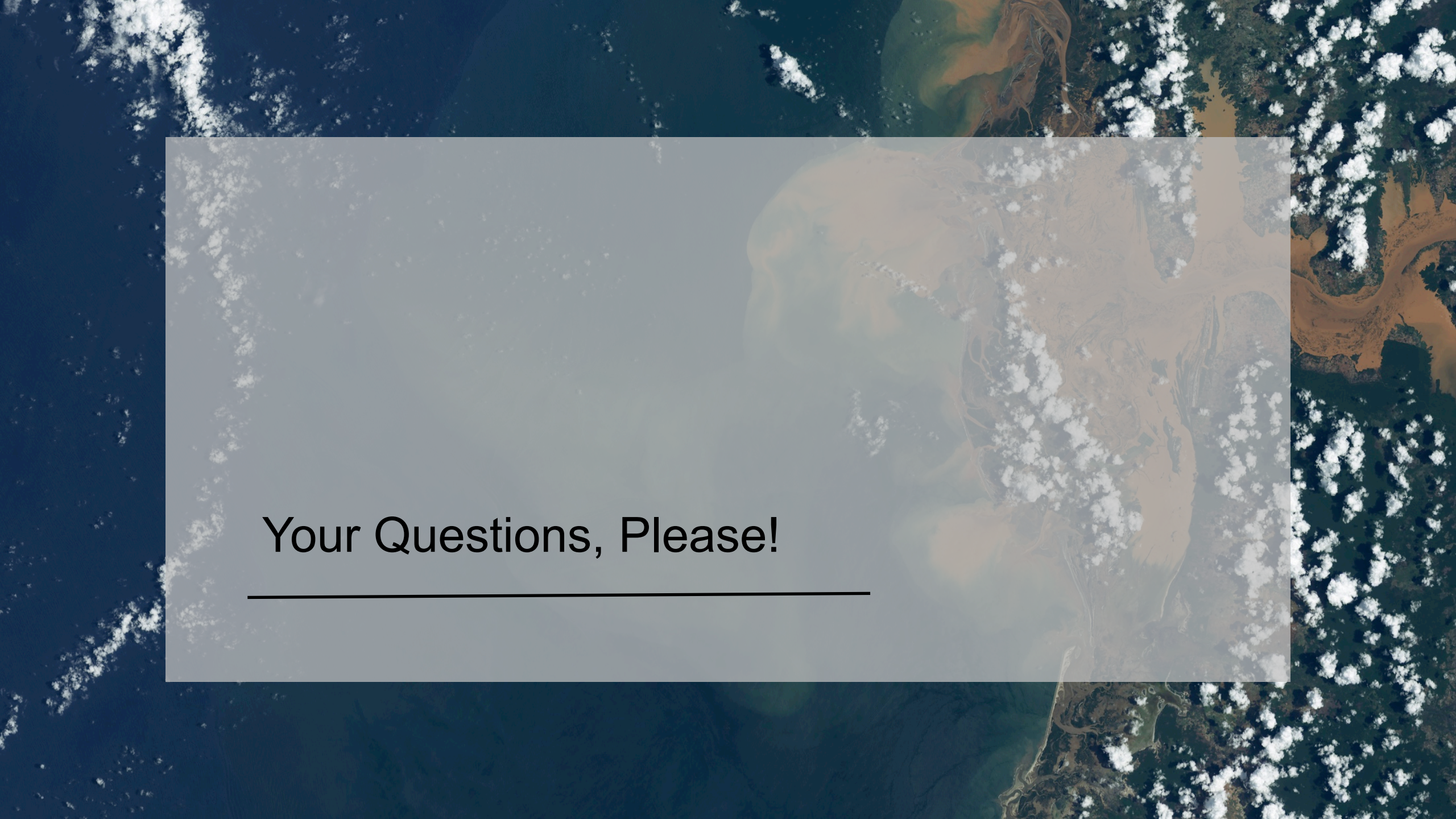
- Visual spectral approaches require no clouds and daylight – can be a big limitation
- Radar allows 24/7 observations if winds are in a narrow range, but many false positives (other data may reduce)
- Satellites feature: coarse resolution, poor coverage, infrequent revisit
- Slow revisit enhances cloud risk
- All space-based current approaches are non-diagnostic - most useful if a spill is known and well behaved
- Visual spectral approaches work poorly at high latitudes (too much air)



Question & Answer Format

Question and Answer Flow and Format

- Enter your question into the webinar interface
- NASA disaster applications professionals will select questions and type them on the whiteboard
- A short verbal answer will be given for the selected question
- Follow-up questions may be taken
- If a question is answered by an English speaker, we will try to provide a written translation into Spanish
- Please be patient, we will address as many questions as possible during the sessions



Your Questions, Please!